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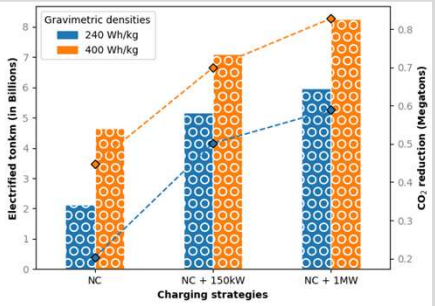
# Technology potentials for battery electric heavy-duty vehicles in Switzerland

Technical assessment to evaluate the potential of electrification of Swiss domestic road freight transport. Generate energy demand for heavy-duty trucks in Switzerland applying established methodology [1] and using GTE data [2]. Assessing volume and weight limitation factors for battery sizing using two different gravimetric densities to identify electrifiable trucks on the current fleet. Three charging scenarios are tested: Night charging at the depot (NC), NC+ 150kW (night charging + day charging at trip destination at 150kW) and NC + 1MW. Electricity demand spatial distribution varies depending on the charging scenarios. From 20 to 80% of the total ton-km of domestic road freight transport are electrifiable, which implies a reduction from 0.2 to 0.8 Megatons of $CO_2$ per year.

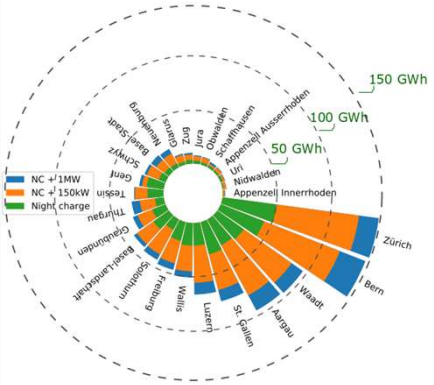
Economical assessment for electrifiable trucks. Total cost of ownership (TCO) model to evaluate economic costs for truck owners comparing diesel vs electric truck using today's market prices for technology, energy, etc., and market forecasted prices for the next 10 years [3]. Electric truck become economically more attractive on the following years. Therefore, the electric heavy-duty trucks are a feasible solution for Swiss domestic road freight transport.

## Potential electrification



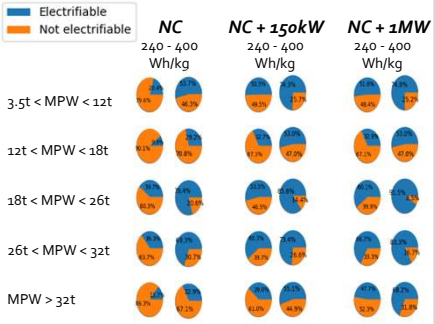

- Electrification potential under 3 charging strategies and 2 gravimetric densities.
- $CO_2$ emission reduction when electric trucks are charged with Swiss electricity mix (138,5 $CO_2$g/kWh)

## Impact on the electric grid



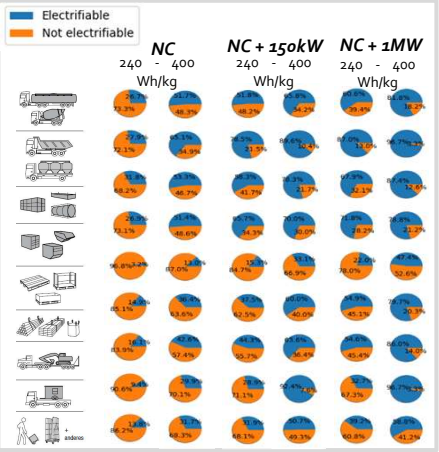

Electricity demand varies among cantons. Population and industrial activity are key.

## Electrification (truck size)




Truck size is a relevant feature for battery electrification because it limits the volume and weight available for the batteries.

## Electrification (truck type)




## TCO Model for 240Wh/kg

**TCO Model for 5 years**
**Included:**

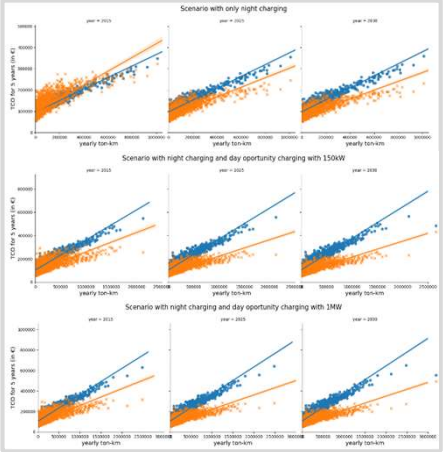
- Purchasing price
- Energy costs
- Taxing (LSVA & Mineralölsteuer only for Diesel trucks)
- Financing costs
- Remaining value at end of use (battery value not included yet)
- Maintenance costs

● Diesel
× Electric

**Not included:**

- Infrastructure investment (Grid upgrade and chargers)
- External costs (noise, pollution, health, buildings, nature…)

## TCO analysis results




## References

[1] Çabukoglu, E., Georges, G., Küng, L., Pareschi, G., & Boulouchos, K. (2018). Battery electric propulsion: an option for heavy-duty vehicles? Results from a Swiss case-study.
[2] Bundesamt für Statistik (2015). Gütertransporterhebung GTE2015
[3] Kühnel, S., Hacker, F., Görz, W.: Oberleitungs-Lkw im Kontext weiterer Antriebs- und Energieversorgungsoptionen für den Straßengüterfernverkehr. Editor: Öko-Institut, Berlin/Germany (2018)

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